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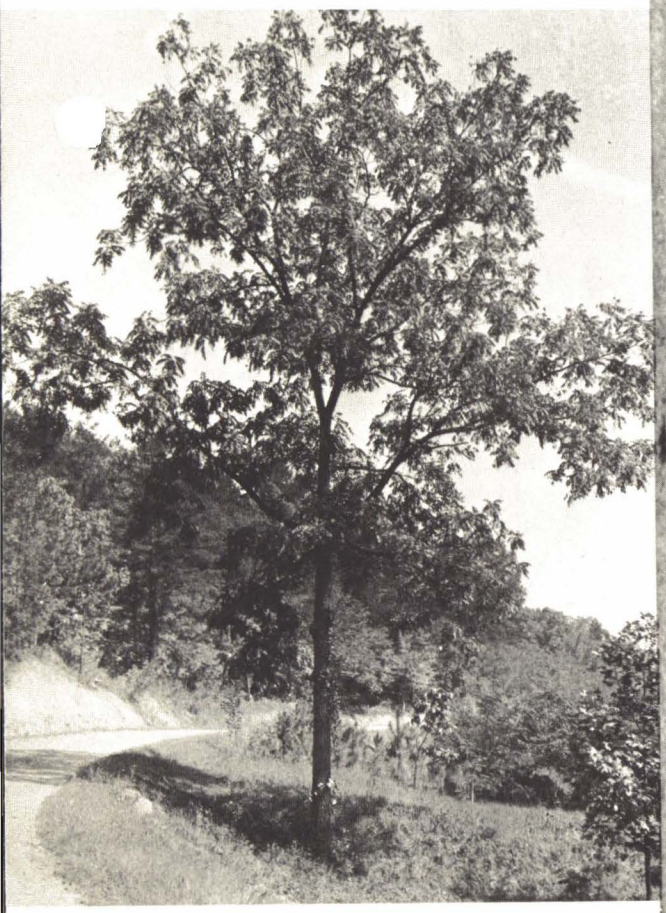
BLACK WALNUT

... an American wood

Black walnut, one of America's most valuable tree species, has been prized since colonial times for furniture, interior finish, and gunstocks. Its nuts have a distinctive flavor that is relished by many. The decay-resistant heartwood is chocolate brown and occasionally has darker, sometimes purplish, streaks. The sapwood is almost white. It is straight-grained, strong, hard, heavy, stiff, easily worked with tools, and stays in place well after seasoning. Because of heavy use and wasteful cutting over the years, choice black walnut trees have become scarce and the price of logs has skyrocketed.



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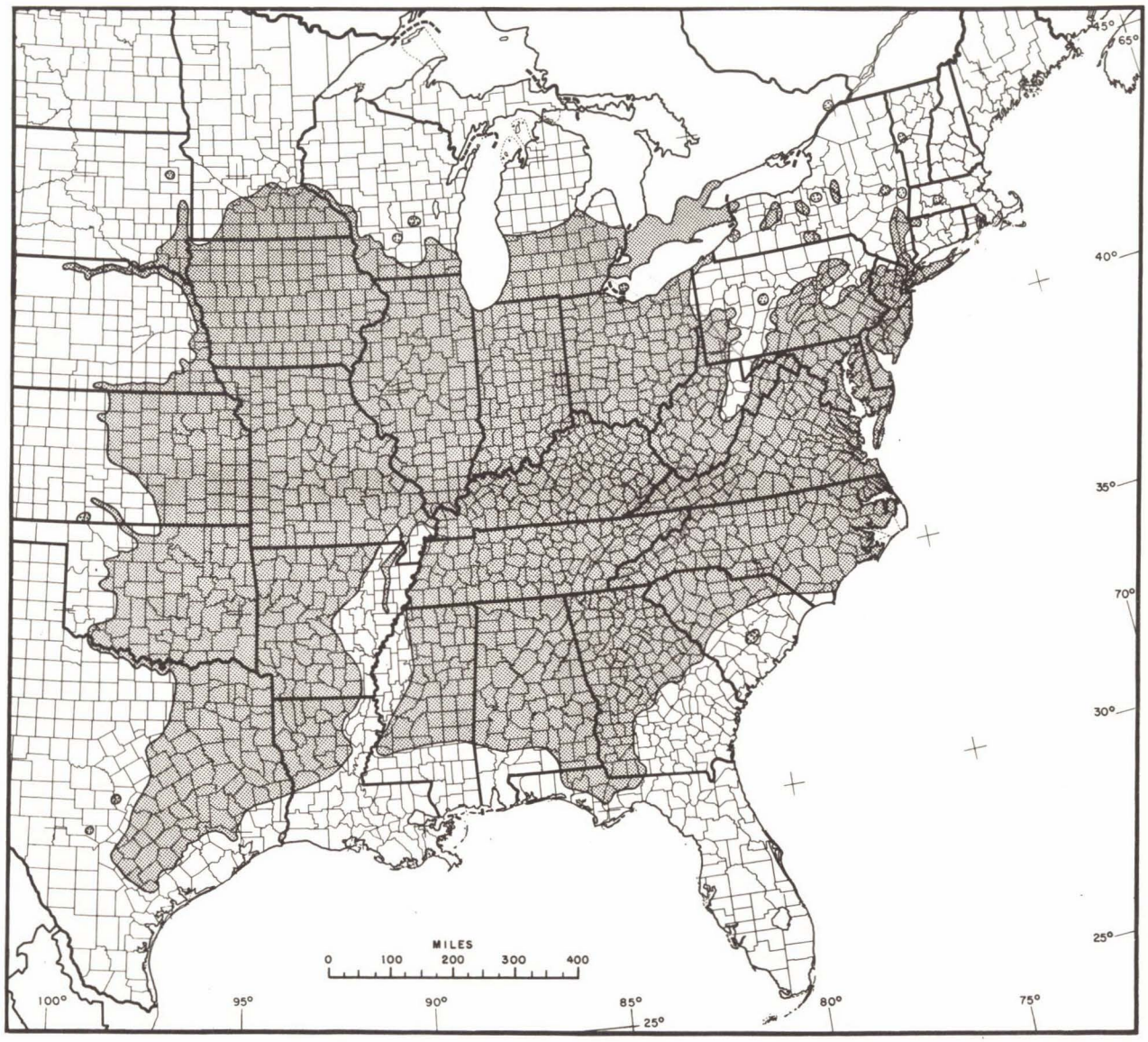

Figure 1.—Natural range for black walnut, *Juglans nigra*.

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BLACK WALNUT

(*Juglans nigra*) L.

Eugene F. Landt and Robert E. Phares[1]

DISTRIBUTION

Black walnut is found throughout the Central and Eastern parts of the United States (fig. 1). Its natural range extends northward to the southern parts of Minnesota, Wisconsin, Michigan, New York, Vermont, western Massachusetts, and northwestern Connecticut; westward to eastern Texas, western Oklahoma, central Kansas, and southeastern South Dakota; and southward to northern Florida, Mississippi, Arkansas, and Louisiana. In the Appalachians, black walnut is seldom found at elevations over 4,000 feet. It is also rarely found in the lower Mississippi Valley and Delta regions. The area of greatest commercial importance of black walnut is limited to the central part of its range, particularly the States of Missouri, Iowa, Illinois, Indiana, Michigan, Ohio, West Virginia, Kentucky, and Tennessee.

Black walnut typically grows as scattered individual trees or in small groups in mixture with a wide variety of other hardwoods. Pure stands of walnut are rare, small, and occur as groves at the edge of hardwood forests. In the central and northern part of its range, black walnut frequently appears with yellow-poplar, white ash, black cherry, basswood, beech, sugar maple, red oak, and hickories. On the limestone soils in Kentucky, Tennessee, and western Missouri, black walnut is often found growing with red cedar and honey locust. Other common associates in the southern, central, and western parts of its range include elm, hackberry, green ash, and boxelder.

DESCRIPTION AND GROWTH

Mature black walnut trees on good sites may grow 100 to 120 feet in height and 30 to 40 inches in diameter breast height (d.b.h.). However, a few exceptional black walnut trees have been measured that were 130 to 150 feet in height and 72 to 100 inches d.b.h. When growing under forest conditions, the stem is generally straight and clean, whereas open-grown trees are frequently forked and limby (see cover).

The leaves of black walnut are 12 to 24 inches long and are composed of 15 to 23 pointed, saw-toothed leaflets. They are paired except at the end, and are attached to a stout, fuzzy petiole (leaf stem) (fig. 2). The flowers of black walnut appear in April or May; the male flowers develop as 2- to 4-inch-long catkins on 1-year-old twigs while one or two, rarely more, small green female flowers develop on the terminals of new twig growth on the same tree. The fruit, 1½ to 2½ inches in diameter, matures in early autumn and has a fleshy husk; hard shell; and an oily, edible seed. The bark of mature walnut trees is gray and deeply furrowed.

The roots, leaves, and seed husks of black walnut contain a substance, called juglone, that is toxic to many plant species. Several of the conifers have been reported to have been killed when growing in mixture with walnut. Actual contact with the roots of walnut appears to be necessary before the associated species is affected by juglone. There have been no reported cases of toxic effects on other hardwoods, but certain agricultural crops such as alfalfa and tomatoes are easily injured by the compound.

Black walnut is sensitive to soil conditions. It grows best on deep, well-drained, nearly neutral soils which are moist and fertile. The most favorable sites are in coves, along narrow streams, and on north- and east-facing slopes. This species does especially well on limestone-derived soils. Black walnut seedlings do not grow well or survive very long, on wet bottomlands, on sandy dry ridges and slopes, or on soils underlain by shallow bedrock or gravel which limit deep rooting. Good internal drainage and soil aeration are prerequisites for good growth of this species.

Black walnut is one of the more rapid-growing hardwoods. On good sites, young trees may grow 3 or 4 feet in height per year, and in 20 years may attain heights

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Figure 2.—Bark, leaves, and flowers of black walnut.

of 40 to 50 feet with diameters of 6 to 10 inches. Because it responds well to management, growth of immature trees can often be more than doubled by release (thinning) and other cultural practices.

Young black walnut seedlings are intolerant of shade and are seldom found under dense canopies of trees. Because the seed is heavy, the chief means of seed dispersal is by squirrels which carry seeds from beneath the tree and bury them at a distance. Regeneration develops primarily from seed which the squirrels fail to recover. Sprout reproduction occurs but cannot be counted on to regenerate a stand of walnut.

Good seed crops are produced irregularly, perhaps twice in 5 years. Open-grown trees may produce some seed when only 4 to 6 years old, but heavy seed crops do not occur until the trees are 20 to 30 years old. Millions of pounds of black walnut seed are harvested annually from natural grown trees. Because the nuts are valuable, much work has been done to select and propagate the best nut producers. More than 100 named varieties of black walnut have been selected and planted in walnut orchards throughout the eastern United States.

COMMON NAMES

Black walnut is the name commonly used. Other names used are American walnut or simply walnut. Less frequently, American black walnut is used.

SUPPLY

In 1963, according to the 1965 Forest Service report on *Timber Trends in the United States*, the total volume of black walnut sawtimber on commercial forest lands in the United States is estimated at approximately 2.7 billion board-feet (International 1/4-Inch Log Rule) distributed as follows:

Region	*Sawtimber stand* (Million board-feet)
Central	1,532
Atlantic	657
Gulf	308
Plains	140
Lake	72
Total	2,709

Ten States (the six Central States and four bordering States) each have more than 100 million board-feet of sawtimber. Missouri, Kentucky, and Ohio alone have more than 900 million board-feet, or one-third of the walnut sawtimber volume in the country.

In addition to the walnut timber on commercial forest land, some walnut grows in open pastures and narrow forested strips along small streams, windbreaks, and fence rows. These areas, although tree covered, are not classed as commercial forest land because of their small size. Therefore, standing timber from these sources is not included in the black walnut timber-volume estimates reported. Recent studies in Kansas and Kentucky, for example, indicate that volumes on noncommercial land equal roughly one-fourth the walnut inventory volumes on commercial forest lands.

From 1949 to 1958 the average price for walnut logs was $413 per thousand board-feet (MBF). Prices ranged from $50 to $960 per MBF depending on the market, log quality, and place of sale. Since 1957, the price trend has been steadily upward for the large veneer-quality logs. In 1970 veneer-quality logs averaged $871 per MBF and export logs averaged $1,578 per MBF.

PRODUCTION

The cut of black walnut lumber increased irregularly from 38,681,000 board-feet in 1899 [2] to a maximum of 87,305,000 board-feet in 1918 (fig. 3). In 1932,

[2] The first year for which statistics of the Bureau of the Census on black walnut lumber are available. Earlier estimates give a maximum production of 125 million board-feet in 1875.

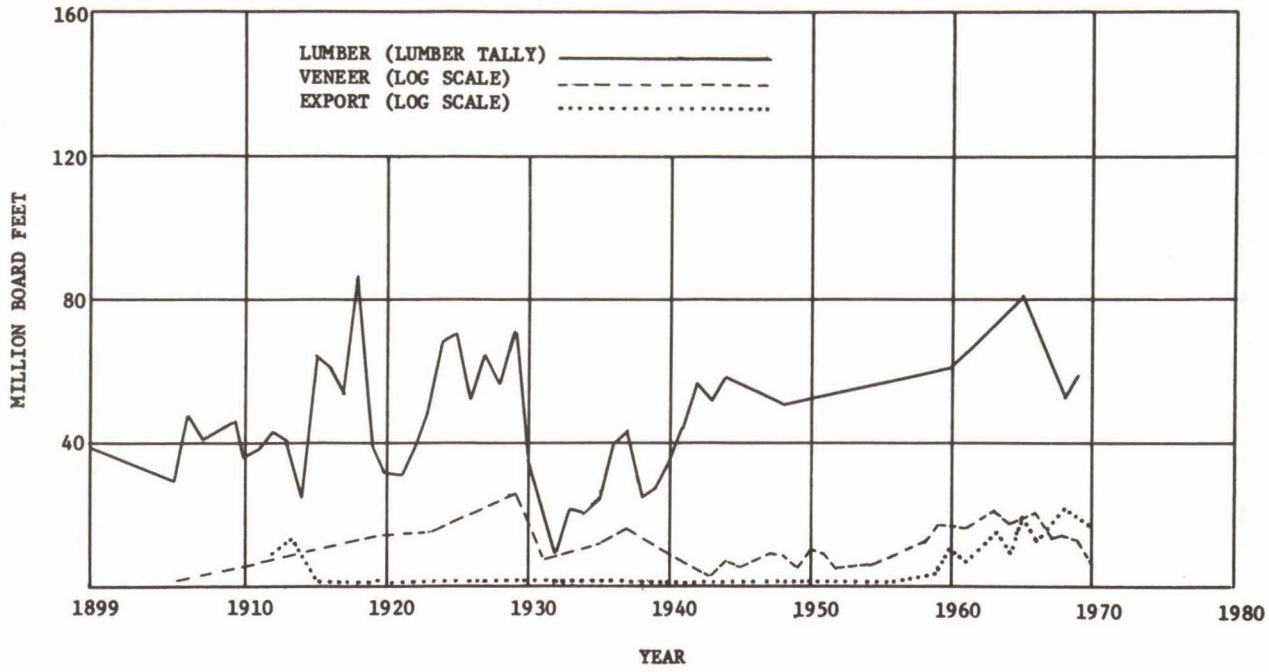

Figure 3.—Production of black walnut *(Juglans nigra).*

a year of business depression, the reported cut reached an all-time low of 9,155,000 board-feet. Since then, lumber production gradually increased, reaching 59 million board-feet in 1969.

The leading States in the production of walnut lumber are Illinois, Indiana, Iowa, Kansas, Kentucky, Missouri, Tennessee, and West Virginia. The average annual lumber production for the years 1967, 1968, and 1969 is estimated at about 58 million board-feet.

Black walnut is an important source of decorative veneer. The amount of black walnut used for veneer increased from 1,725,000 board-feet log scale in 1905 to a maximum of 26,893,000 board-feet in 1929. In 1931 consumption dropped to 8,524,000 board-feet because of the Depression. Then during World War II in 1943 consumption dropped to an all-time low of 3,542,000 board-feet. Consumption remained below 10 million board-feet until 1957. Then consumption started to increase to a high of 20,766,000 board-feet in 1963 and in recent years has declined to 7,562,000 board-feet for the year of 1970.

Export of black walnut logs has not reached importance until recent years. Black walnut now is in strong demand in both American and foreign markets; and logs, bolts (segments of logs less than 8 feet long), and timbers are being exported in increasing quantities. Export rarely exceeded a million board-feet per year until 1958. Since then, export has gradually increased to a high of 21,896,000 board-feet in 1968. Export for 1970 was 17,229,000 board-feet. West Germany, Italy, Canada, Japan, Switzerland, The Netherlands, and the United Kingdom all imported large quantities.

CHARACTERISTICS AND PROPERTIES

Black walnut is a heavy wood, averaging 38 pounds per cubic foot. The wood is hard, with a specific gravity of 0.51, strong, stiff, and highly resistant to shock. In durability under conditions favorable to decay, the heartwood of black walnut ranks with the most durable woods, including cedars, chestnut, and black locust. It can be satisfactorily kiln-dried or air-dried and holds its shape well after seasoning. Black walnut is normally straight-grained, works easily with hand tools, and has excellent machining properties. The wood finishes beautifully with a handsome grain pattern (fig. 4). It takes and holds paints and stains exceptionally well. It can be readily polished and satisfactorily glued.

The heartwood is chocolate brown and occasionally has darker, sometimes purplish, streaks. The sapwood is nearly white. Forest-grown trees generally have dark-colored heartwood and a narrow band of sapwood not more than 1 inch wide. In open-grown trees the heartwood is generally lighter in color and the sapwood is about 3 inches wide. It is common practice to darken the sapwood by steaming or staining to match the heartwood. The annual rings of growth are marked by many pores barely visible on the end grain at the beginning of each year's growth and by denser growth

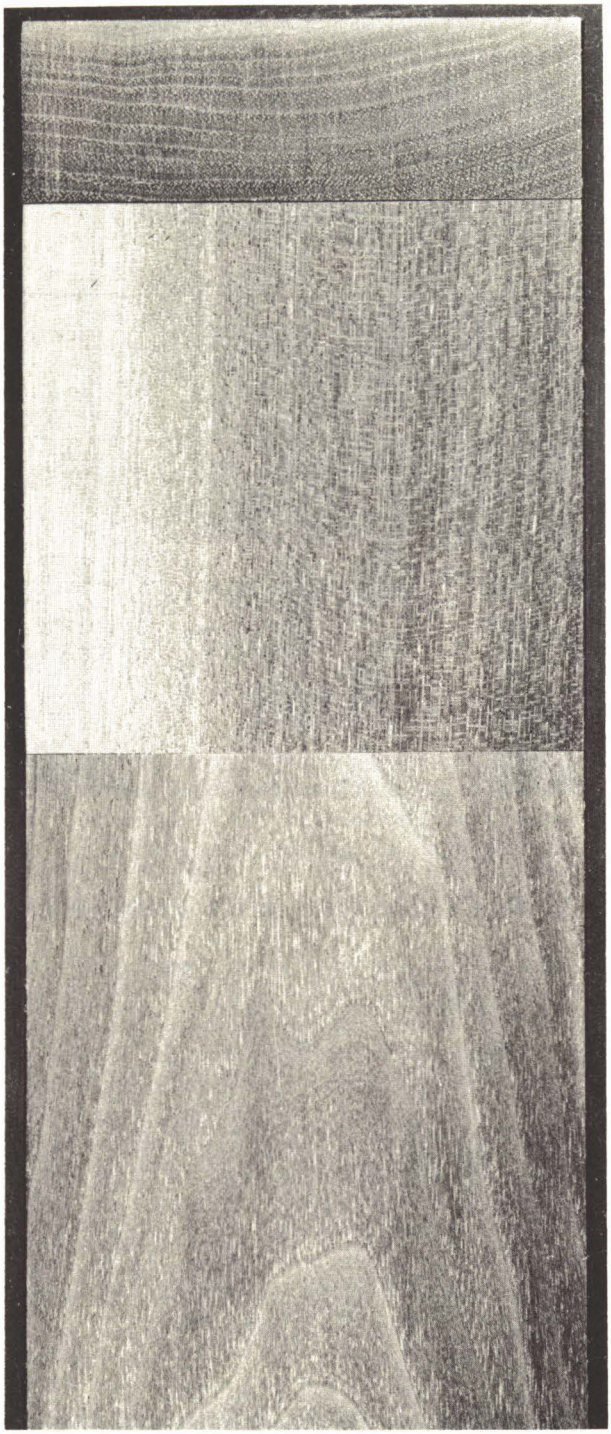

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Figure 4.—Grain pattern of the wood of black walnut; from the top: Cross section, radial section, and tangential section.

at the end of the season. The wood frequently contains alternate light and dark stripes that give figure effects in boards and veneer. Wavy or curly grain near knots, abnormal or irregular growth, crooks, forks, burls (an abnormal growth of wood tissue), and stumpwood also result in a variety of handsome figures. Burls from very old trees have a bird's eye figure on a glossy dark groundwork ranging from almost jet black to lighter shades of brown. This gives them an exceptionally high value.

PRINCIPAL USES

The outstanding use of black walnut is for furniture and fixtures. Other important uses are for radio, television and photograph cabinets, sewing machines, gunstocks, and interior finish. It is used either in the form of solid wood cut from lumber or in the form of plywood made by gluing sheets of plain or figured veneer to both sides of a core. Intermediate sheets (crossbands) are often used between the faces and core to form five-ply crossbanded plywood. In all cases the direction of the grain in the various layers or plies is at right angles to the grain in the adjacent ply or plies. Until 1964 a common thickness of black walnut face veneer was one-twenty-eighth of an inch. In 1964 thickness of face veneer was reduced to one-thirty-sixth of an inch. The core and intermediate plies are usually made of less expensive woods, such as basswood or yellow-poplar. Cores vary in thickness. They may be veneer, lumber one-fourth inch thick and up, or particleboard.

Black walnut veneer is made by the slicing method and, to a limited extent, by the rotary-cut method. In the slicing method, a thick slab (flitch) sawed from the log is clamped to a movable bed that slides up and down in diagonal guides. The flitch is sliced into veneer with a heavy adjustable knife that is advanced after each cut. In the rotary-cut method the log is revolved against a constantly advancing knife. Black walnut veneer is occasionally made by sawing.

Black walnut furniture is made principally for dining rooms and bedrooms. Dining room tables of black walnut stand up especially well under the hard usage such tables often get. Bookcases, desks, living room tables, and many other pieces are also frequently made of walnut. The wood is in demand for office furniture. It is widely used in all kinds of radio, television, and phonograph cabinets, and piano cases. For the highest grade cabinets, plywood panels, faced with figured veneer, are used. For interior finish in cafes and public buildings where striking effects are desired, walnut is very popular. The wood is particularly suitable for gunstocks because of its ability to stay in place after seasoning, its fine machining properties, its uniformity of texture combined with a slight coarseness that renders it easily gripped, and its sufficient strength and shock-resisting ability without excessive weight. Figured black walnut stocks are used for the more expensive shotguns and sporting rifles.

The nuts of black walnut have long been used as an article of food, principally in candy making and in

breads and cakes. The shells are thick and the kernels difficult to extract.

The early settlers in America valued the black walnut trees not only for their wood and nuts but also for other things such as rich brown dye from the green hulls of the nuts. The hulls may also have some importance for medicinal purposes. Recent research showed that extracts from the green walnut hull were capable of immobilizing fish, mice, rats, and rabbits. Walnut shells when cleaned and processed are used as abrasives and in filter materials.

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